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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT PAPER NUMBER

1753

DATE MAILED: 10/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/719,759

Applicant(s)

SU, CHIN-TA

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Besser et al. (U.S. Pat. 5,970,370).

Regarding claims 1, 7, 8, 13, Besser et al. teach a process for cobalt salicide production. (Column 6 lines 37-39) The salicide process involves providing a silicon substrate 10 having a polysilicon layer 822 thereon. (Column 6 lines 44-56) A metallic cobalt layer 402 is formed on the silicon layer 822. (Column 6 lines 57-60) The Cobalt layer can be deposited by sputtering. (Column 4 lines 23-47) A titanium nitride layer 403 can be formed on the cobalt layer. (Column 6 lines 57-60) The titanium nitride layer can be formed by sputtering over a layer of TiN over the cobalt layer. (Column 4 lines 48-67) The titanium nitride is in the form of (TiN). (Column 5 lines 1-3; i.e. N =1 which is greater than 0.9) A first thermal process is preformed to form the cobalt salicide layer. (Column 6 lines 63-68; Column 7 lines 1-3; Column 6 lines 1-7) An etch is used to remove the remaining non-reacted cobalt layer. (Column 7 lines 11-19; Column 6 lines 7-20; Fig. 6; Fig. 11)

Regarding claims 2, 8, 13, the substrate is subjected to a second thermal process after the non-reactive cobalt layer is removed. (Column 7 lines 19-25; Column

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6 lines 19-26) The second thermal anneal produces a highly conductive layer which thus decreases the resistance of the layer. (Column 7 lines 22-23)

Regarding claims 3, 9, 14, the TiN is formed by a sputtering process. (Column 4 lines 48-68; Column 5 lines 1-4)

Regarding claims 4, 10, 15, N<sub>2</sub> and Ar gas is used for the sputtering process. (Column 4 lines 48-68; Column 5 lines 1-4)

Regarding claims 5, 11, 16, the N<sub>2</sub> to Ar ratio is approximately 3:1 since Besser et al. suggest utilizing about 70% N<sub>2</sub>. (Column 4 line 60)

Regarding claims 6, 12, 17, the thickness of the TiN layer can be 100 Angstroms. (Column 5 lines 48-51)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Besser et al. (U.S. Pat. 5,970,370) in view of Giewont et al. (U.S. Pat. 6,388,327).

Besser et al. is discussed above and all is as applies above. (See Besser et al. discussed above)

The differences between Besser et al. and the present claims is that the ratio of x in the  $TiN_x$  layer being greater than 0.9 is not discussed.

Besser et al. already establish that the N in the TiN layer can be 1 which is greater than 0.9. (See Besser et al. discussed above) Giewont et al. is further cited to show that the capping layer of a cobalt layer can comprise a nitrogen rich layer of TiN and a layer of pure Ti. The thickness of the nitrogen rich TiN layer can be 50 Angstroms. (See Giewont et al. Column 5 lines 31-43)

The motivation for utilizing a nitrogen rich layer of TiN is that it allows preventing formation of an oxynitride. (Column 5 lines 43-44)


Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Besser et al. by utilizing a nitrogen rich layer of TiN as taught by Giewont et al. because it allows for preventing formation of an oxynitride.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
September 28, 2005